CLAIMS

We claim:

1. A bipolar ionization apparatus comprising:

a positive high voltage power supply having an output with at least one positive ion emitting electrode connected thereto and configured to generate positive ions;

a negative high voltage power supply having an output with at least one negative ion emitting electrode connected thereto and configured to generate negative ions; and

a controller configured to control a duty cycle of the outputs of the positive and negative high voltage power supplies to achieve a desired offset voltage by causing the outputs of the positive and negative high voltage power supplies to overlap by a selected amount of time in excess of zero.

2. The bipolar ionization apparatus according to claim 1, wherein control of the outputs of the positive and negative high voltage power supplies is modified using pulse duration modulation to obtain a user desired shape of an output wave.

3. The bipolar ionization apparatus according to claim 1, wherein the overlap results in a square wave when associated current amplitudes of the power supplies are fixed.

4. The bipolar ionization apparatus according to claim 1, wherein the overlap results in one of a sine wave, a square wave, a saw tooth wave and a clipped wave when the amplitudes are variable.

5. The bipolar ionization apparatus according to claim 1, wherein the desired offset voltage is adjustable by a user.

6. A bipolar ionization apparatus comprising:

a positive high voltage power supply having a variable output with at least one positive ion emitting electrode connected thereto and configured to generate positive ions;

a negative high voltage power supply having a variable output with at least one negative ion emitting electrode connected thereto and configured to generate negative ions; and

a controller configured to continuously control the outputs of the positive and negative high voltage power supplies to achieve a desired offset voltage by varying the outputs of the positive and negative high voltage power supplies to alternately control to a positive setpoint for a predetermined period of time and then to a negative setpoint for another predetermined period of time while continuously outputting both positive and negative ions.

7. A method of controlling an offset voltage of an ionization system, the ionization system including positive and negative high voltage power supplies, each of the power supplies having a respective output with at least one ion emitting electrode connected thereto for generating ions, the method comprising:

controlling a duty cycle of the outputs of the positive and negative high voltage power supplies to achieve a desired offset voltage by causing the outputs of the positive and negative high voltage power supplies to overlap by a selected amount of time in excess of zero.

8. The method according to claim 7, wherein the duty cycle is modified using pulse duration modulation to achieve a user desired shape of the output wave.

9. The method according to claim 7, the overlap results in a square wave when associated current amplitudes of the power supplies are fixed.

10. The method according to claim 7, wherein the overlap results in one of a sine wave, a square wave, a saw tooth wave and a clipped wave when the amplitudes are variable.

11. The method according to claim 7, further comprising the steps of:

determining a particular overlap of the outputs of the positive and negative high voltage power supplies that achieves a particular offset voltage;

storing the particular offset voltage and the corresponding particular overlap in memory; and

controlling the duty cycle and the overlap based upon the stored offset voltage and the stored corresponding overlap when the desired offset voltage is approximately equal to the stored offset voltage.

12. The method according to claim 7, further comprising the steps of:

measuring an actual voltage potential in an area surrounding the ionizer;

comparing the actual voltage potential to the desired offset voltage; and

controlling the overlap based upon an algorithm that uses the comparison of the actual voltage potential to the desired offset voltage.